POLAND

Military

Text of an article entitled: "Some Principles of Planning and Organisation of Technical Support for the Operations of an Armoured (Mechanised) Division"

Contents:

Introduction

1. Technical support of troops in conditions of their full motorisation and mechanisation, and the mass use of nuclear weapons on the battle-field, has become a matter of particular importance, since it is a decisive factor in the combat readiness of units and the possibility of using them as intended. The extent of this support embraces not only the repair and evacuation of damaged equipment, but also the preparation of combat vehicles for crossing areas contaminated with radio-active substances, field engineering obstacles and barriers, areas destroyed by nuclear weapons, and the forcing of water obstacles.

2. In order to ensure the rapid return to the troops of damaged combat vehicles, it is essential constantly to improve the methods and means of repair and evacuation, the system of supplying troops with means of repair and spare parts, the organisational structure of sub-units (units, workshops) engaged in

.../ repairs and evacuation,

repairs and evacuation, and the principles of their employment under field conditions. In addition, considerable attention should be paid to the equipment of the repair and evacuation sub-units (units, workshops) with suitable communications facilities, since the possibility of carrying out repairs and evacuation in good time depends on the efficient operation of the system of communications. The possibility of ensuring for the troops suitable conditions for conducting combat operations in accordance with the tasks given to them will depend on the overall solution of the above problems and the proper application in practice of the accepted norms and principles of technical support. The present essay will discuss the most important principles of organisation of repairs, evacuation, supply, and technical servicing of armoured equipment, and the planning and direction of the technical support forces and resources of an armoured (mechanised) division in offensive operations.

I. General Principles of the Organisation of Technical Support for the Operations of an Armoured (Mechanised) Division

3. The correct employment of armoured equipment from the technical point of view consists of using it for the purpose for which it is intended, while taking into consideration the technical norms and principles of use laid down for the given type of vehicle, applied in varying field conditions and combat situations.

4. One of the important factors affecting the efficient organisation of the use of armoured equipment is the determination, as accurately as possible, of the mileage which will be covered during the future operations. This quantity, measured in kilometres covered /kilometry przebiegu/, forms the initial quantity for determining the time, location, and work connected with technical servicing, supply requirements, and repairs of combat vehicles resulting from between-repair norms /normy miedzyremontowe/.

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5. The mileage depends on the depth of the tasks and on the manoeuvre executed by the armoured units on the battle-field. It is always greater than the distance covered by the forces in course of operations, as calculated from the map. The ratio of the distance measured on the map to the actual distance covered by the troops in course of operations is indicated by the manoeuvre factor [wspolczynnik manewru] (M), given in Table 1.

Table 1.

Types of combat operations	Value of the manoeuvre factor (M)
Breaking through previously-prepared enemy defence	2.5 - 3.0
Breaking through a hastily-prepared enemy defence	1.8 - 2.0
Encounter battle	2.0 - 2.5
Pursuit	1.4 - 1.6

6. A manoeuvre of forces on the battle-field takes place also during defensive operations. In this case, the manoeuvre will be greatest in units of the second echelon, or in reserves, on account of the fact that they will be executing counter-attacks (counter-thrusts). For this reason, the manoeuvre factor for these units (reserves) will be approximately the same as in the case of an encounter battle.

7. During a march, the extent of the mileage of combat vehicles (in kms.) will depend on the length of the march route and the situation and profile of the road. The value of the factor of increase of the length of the march route, as measured on the map, is given in Table 2.

.../Table 2.

Table 2

Terrain	Factor of increase of the length of the march route		
	map scale		
	1:200,000	1:100,000	1:50,000
Mountainous	1.25	1.2	1.15
Hilly	1.15	1.1	1.05
Plain	1.05	1	1

8. In order to determine the consumption of the stock of mileage (in kms.) of combat vehicles, one should multiply the length of the march route (depth of the combat task), measured on the map, by the appropriate factor.

9. The possibility of preparation of combat vehicles for operation in difficult topographical conditions and combat situations depends above all on an efficient and correct organisation of technical servicing. This includes checking the efficiency of portable generators /agregat/, assemblies, and mechanisms, adjustments, topping up fuel (expendable stores), charging batteries, charging compressed air cylinders, and washing and cleaning of combat vehicles.

10. When organising technical servicing, one should observe the following principles:

- the planned measures connected with technical servicing should always be executed at the appointed times;
- the servicing should be done by the crews and the servicing and repair forces and resources allocated to the sub-units;
- the servicing of combat vehicles during operations should be carried out direct in the combat grouping;

.../ the servicing

- the servicing should be carried out to its full extent, according to the norms and conditions laid down for the given type of technical service.

11. Technical servicing in sub-units, units, and tactical formations includes inspection and technical servicing Nos. 1, 2 and 3. The total duration of each type of technical servicing depends on the type of the combat vehicle (this includes the work of the entire crew).

12. Work forming part of technical servicing is carried out by the crews (drivers), under the direct control of company commanders, their deputies for technical matters, and platoon commanders. In order to shorten the total time allocated for technical servicing, and to correct any faults which may come to light, the sub-units may have allocated to them the unit servicing and repair forces and resources*.

13. The necessity for carrying out a given type of technical servicing is determined on the basis of the mileage consumed so far since the last technical servicing, and the planned period of use of the equipment in future combat operations (taking into account the depth of the task and the intensity of the battle).

14. In order to carry out technical servicing in the course of combat, advantage is taken of any convenient combat situation. The servicing is performed direct in the combat grouping (or in nearby places of concealment), during halts or breaks in the battle, and when carrying out various types of repairs. In all cases, during technical servicing, one should maintain the combat readiness of sub-units and units.

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* The principle employed is "servicing means appropriate to the equipment being serviced".

15. Control inspections are carried out before each departure (march) and during short halts.

16. Technical servicing No.1. is carried out after the completion of the of the appointed task by the troops, regardless of the mileage since the last servicing.

17. Technical servicing No. 2. and 3. is carried out depending on the existing combat situation, the time available for the work and the technical state of the equipment. For instance, if there is insufficient time to carry out technical servicing No. 2. to its full extent, then one should carry it out in a number of stages, taking into account above all the current technical condition of the equipment. In such a situation, priority is given to work affecting the combat readiness of the sub-units. The time and place for the technical servicing of combat vehicles is laid down by sub-unit (unit) commanders. The method and sequence of the servicing should ensure the rapid and concealed completion of the whole work. If it is found that the equipment has been contaminated, one should carry out a de-activation of the equipment before the start of the technical servicing.

18. The possibility of assuring the supply to units of the necessary amount of armoured equipment depends to a large extent on the correct organisation and timely execution of repairs of damaged combat vehicles.

19. When organising repairs, one should determine the extent of the probable amount of equipment due for repair and its location, prepare sites for the setting up of repair facilities, issue tasks to the repair sub-units, lay down the method and time of moving them on, and make provision for executing a manoeuvre with them into areas containing the greatest incidence of damaged equipment. The equipment due for repair includes all the items which have been withdrawn for various reasons from the combat grouping and have to be repaired by special sub-units. These items may consist of equipment damaged

/... by artillery fire,

by artillery fire, air bombardment and explosion of anti-tank mines, or through normal wear and tear (or improper use) of certain assemblies in combat vehicles.

20. The repairs are normally executed by means of replacement of damaged or faulty assemblies, sub-assemblies, or components, and by welding, metal-working, etc. In certain cases the repairs can be executed by a combined method, i.e., a part of the assemblies, instruments and components are repaired, while the remainder is replaced with new ones.

21. During the Second World War, the tank losses of a tactical formation (as compared with the position at the start of the battle) were as follows*:

- in attack against permanent defences: 18 - 30%
- in attack against hastily-prepared defences: 8 - 10%
- in attack including the forcing of a water obstacle 10 - 15%
- in an encounter battle: 15 - 20%

22. Of the total number lost, the proportion suitable for various classes of repair was as follows:

- running repairs: 35 - 45%
- medium repairs: 20 - 30%
- capital repairs: 5 - 10%
- total loss: 25 - 30%

23. In defensive operations, the tank losses were: in units - 10 to 12%, and in a tactical formation - 8 to 10%. These were classified for repair as follows:

- running repairs: 30 - 35%
- medium repairs: 10 - 15%
- capital repairs: 5 - 10%
- total loss: 45 - 50%

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* The losses in units operating in the first echelon and on the main axis were on the average 2 - 2.5 times greater than those stated.

24. The number and division of combat losses into various types of repair was not always the same. In units and formations which were breaking through permanent enemy defences, or which engaged in fierce encounter (defensive) battles, the losses were considerably greater than as stated above, and there was a larger proportion of vehicles regarded as a total loss.

25. Under modern conditions of combat operations, it is necessary to assume two forms of losses, namely losses caused by conventional weapons (such as artillery shells, aerial bombs filled with conventional explosives, mines, fougasses, etc.), and losses caused by nuclear weapons.

26. In the first case, the losses of armoured equipment will follow the pattern of the Second World War. They will mainly occur in units in direct contact with the enemy, where the enemy is not at liberty to use nuclear weapons, for fear of inflicting casualties on his own forward sub-units.

27. Losses caused by nuclear weapons (Diagram No. 10) will depend on the density of combat vehicles in the combat grouping, and on the nature of the ground and the constructional characteristics of the various types of armoured equipment. The smallest worth-while target for nuclear strikes is a tank company, which during combat operations forms a closely-knit element of the combat grouping of units.

28. During nuclear strikes, damage to armoured equipment is caused primarily by the effect of the shock-wave (Appendix No. 1). Taking the area covered by a tank company (16 combat vehicles) to be 1 sq.km., and under the most favourable conditions for enemy nuclear strikes (the centre of the target coinciding with the point of burst), tank losses at various yields of the missiles (bombs) will be as follows:

- 2 kt. /kiloton/: 3 tanks
- 5 kt. 5 tanks
- 8 kt. 8 tanks
- 20 kt. 15 tanks

29. It follows from the above, that the explosion of a missile (bomb) of a yield of 20 kt. completely eliminates a tank company from the battle-field. To regard the matter in this way would, however, be an excessive simplification, since as a rule there is a divergence between the planned and the actual point of burst. In calculations of this sort, one should take into account a number of factors affecting the size of the stricken area of the target, namely the dimensions of the target, the power of the nuclear device (the radius R of the damage zone), and the size of the deflection of the point of burst of the device (W) from the centre of the target (planned ground zero P), which are expressed by the values Ug and Us.

30. The indicators of fire effectiveness when firing against group targets consist of the following:

- effectively beaten zone of target - So,
- mathematical hope [sic] of the percentage of the beaten zone of target - M.

31. Firing against group targets may be done for the purpose of neutralisation or destruction. One assumes the following values of fire effectiveness indicators:

- for neutralisation: So $\geq$ 20%, M 30 ÷ 50%
- for destruction: So $\geq$ 40%, M 50 ÷ 70%

Example: A battalion occupies an area 1.3 x 1.7 kms.; Ug = Us = 0.3 kms.; a nuclear strike has been carried out with a device with a yield of 50 kt.

Solution: Having made all the calculations, we obtain 25%* of the effectively beaten zone of target. This means that, with a probability of 90 per cent, a tank battalion will have had 8 combat vehicles damaged and destroyed.

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* "Information Bulletin", No. 5 (45), 1960, pp. 45-66.

32. A division (regiment) forms for nuclear weapons an objective for strikes consisting of a number of targets, such as a battalion of motorised infantry or a company of tanks. Each of these targets should be regarded separately. The sum of the results of their neutralisation makes it possible to determine the actual or expected losses. Putting the problem more simply, it can be stated that, for example, to neutralise a tank regiment consisting of five tank companies, and to obtain 40% [probability?] of damage to all the combat vehicles it will be necessary to use 5 missiles of 50 kt.

33. When making an assessment of the total losses of a division from enemy nuclear strikes, one should take into account the number and power of the nuclear strikes, and the distribution of these strikes over the division. If it is assumed that the enemy may, for example, carry out 4 - 5 simultaneous nuclear strikes against a dispersed grouping of a division, each of a yield of 20 kt., then the losses suffered by the division may cause the elimination from its composition of one regiment in its entirety (if the majority of the strikes was carried out against one of the regiments of the division), or one sub-unit from each of the various units of the division (for instance, a tank company, infantry battalion, divisional store, artillery battery, etc.). In both cases it is worth-while to carry out repair work (not to mention the necessity for carrying out special treatment and de-activation of combat equipment) so as to restore as rapidly as possible the combat capacity of the division. It will be a more difficult matter if the enemy repeats his nuclear strikes, since in this case it may be necessary to withdraw the division completely into the interior of the country for refitting and re-organisation. A situation of this sort will, however, be extremely rare, not only on account of the need for some time for the preparation of renewed nuclear strikes, but also on account of the necessity for a detailed determination of the new area of deployment of the division.

34. When studying single nuclear strikes carried out by the enemy against the forces of a division, one should take into consideration the type of the neutralised sub-units and their purpose in the general grouping of the division (for instance, a tank company of the first or second echelon, artillery battery, first or second rear echelon, etc.). In all cases, however, one should immediately begin the evacuation and organisation of repairs to combat vehicles.

35. When studying the losses in sub-units and units of tanks, particular attention should be paid to the possibility of neutralisation by enemy nuclear weapons of the crews of the combat vehicles, since one may reach the conclusion that it is more profitable to neutralise the crews than to destroy the armoured equipment. Taking the (optimum) conditions of nuclear strikes, as given above, it can be stated that even a device of a yield of 2 kt. will put out of action 13 crews in a tank company, while a device of 5 kt. will neutralise all the crews. The case for the tank crews is even worse when the nuclear strikes fall on them during the servicing of equipment (i.e., not under cover), since a device of 2 kt. will suffice to eliminate completely the entire personnel of a tank company.

36. Taking the effectively beaten area of a tank company, So = 40%, the destruction of the crews can be achieved by a device of 20 kt., while for the neutralisation of an So = 20%. a 10 kt. device will be sufficient. This has a considerable bearing on the combat readiness of a neutralised unit until the arrival of replacements, and very considerably reduces the possibilities of executing repairs because of the shortage of tank crews. As a rough guide, it is accepted that of all the tanks neutralised by nuclear weapons, 40 to 47% will require running repairs, 13 to 20% will require medium repairs, 13 to 20% will require capital repairs. and 14 to 22% will become a total loss.

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37. Repair work (Appendices Nos. 2 and 3) in sub-units, units and tactical formations is executed by special repair sub-units (units). The purpose of these is:

(a) in a regiment:

- to assist crews in technical servicing and removal of faults;
- to carry out running repairs;

(b) in a division:

- to carry out running and medium repairs*.

38. When organising the repair of armoured equipment, one should observe the following principles:

- priority should be given to the repair of combat vehicles requiring the least expenditure of effort;
- the repairs should be carried out in the course of combat operations, directly in the area of deployment of the damaged equipment (or in places of concealment nearby), after carrying out (if necessary) de-activation and decontamination; if it is not possible to carry out the repairs of the combat vehicle on the spot where it was damaged (or in a nearby place of concealment), then the combat vehicles may be evacuated to the damaged combat vehicle collection point (PZWU);
- repair work in an area neutralised with nuclear weapons is carried out exclusively by the repair forces and resources of the army; a part of the evacuation forces and resources belonging to the tactical formation level may remain in the area, but they should rejoin the attacking forces not later than by the morning of the third day of combat;

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* Under present conditions, running repairs are carried out at tactical levels. Nevertheless, the organisational structure of the sub-units (units) of a division makes it possible to carry out medium repairs, which is of considerable importance in conditions of [redacted] the battle-field.

- one should not allow repair sub-units to separate themselves from the combat grouping of their units beyond the limits permissible in the given situation;
- the extent of repair work should be determined in relation to the level of command (the extent of repair work by the resources of a given level decreases in proportion to the decrease in the level of command).

39. Under modern conditions, the main purpose of technical support for offensive operations includes the safeguarding of the possibility of the forces maintaining a rate of attack of up to 100 kms. in 24 hours. In order to fulfil this requirement, it is advisable to organise, on the tactical formation level, repair brigades drawn from the composition of the Mobile Tank Repair Workshops (RWNCz). These brigades, moving along the axis of repair and evacuation, will will carry out running repairs, the length of which does not exceed a few hours.

40. Another possible variant in the organisation of repair consists of dividing the repair and evacuation forces and resources of the tactical formation into two echelons, each of which is detailed to support the operations of the formation on successive days of combat. With such an echelonment, the forces and resources of each echelon are able to operate in one place during one period of 24 hours.

41. One of the important elements of the organisation of technical support for operations by troops is the evacuation of armoured equipment. This includes the pulling out of damaged combat vehicles from under enemy fire, or from areas which may be captured by the enemy, the towing of damaged or submerged vehicles, and their collection at damaged combat vehicle collection points, or at railway loading stations for transport into the interior of the country.

42. When organising the evacuation, one should specify the probable amount of equipment to be evacuated and its location, prepare routes of evacuation and deployment areas for the means of evacuation, issue tasks to

evacuation sub-units, make provision for manoeuvring them into the areas containing the greatest number of combat vehicles due for evacuation, and determine the method and time of transfer of the evacuation sub-units during combat operations.

43. The equipment to be evacuated consists of submerged vehicles and all other combat vehicles which, owing to the nature of their damage, cannot be repaired on the spot and are unable to proceed under their own power to the area of loading or of deployment of the repair facilities.

44. In combat operations, the evacuation of equipment is organised on the following principles:

- first priority is given to the evacuation of tanks remaining under enemy fire (to the nearest place of concealment);
- above all, one evacuates equipment requiring the least amount of repair work;
- the evacuation of damaged vehicles is carried out directly in the course of combat operations;
- the evacuation is carried out as a rule "for oneself", i.e., with the forces and resourcesof that level of command which will be carrying out the repairs.

45. In order to ensure the rapid transmission of equipment to the repair sub-units, the combat vehicles are evacuated to previously designated and prepared routes of evacuation (the repair and evacuation axis), the number of which depends on the width of the zone of operation of the unit or tactical formation, topographical conditions, and the number of evacuation routes and means. These routes should be cleared with the rear HQ, so as to prevent the occupation of routes set aside for manoeuvring the forces and for the bringing up of supplies.

46. Evacuation of equipment from under enemy fire is possible when arrangements have been made for unbroken observation of the tank sub-units in

action, when the means of evacuation are situated near these sub-units, and when all the evacuation work is being carried out under the protection of own troops. Prime movers detailed for the evacuation of damaged combat vehicles direct from the battle-field are included in the composition of repair and evacuation groups.

47. When determining the sequence of evacuation of damaged combat vehicles, account should be taken of the actual combat situation, the topographical conditions, and the technical state of the vehicles.

48. In order to ensure the shortening of the time of waiting for repairs, the full utilisation of the capacity of the repair and evacuation facilities, and the earliest return of the tanks to the fighting units, the evacuation should be carried out by all means simultaneously, regardless of the level of command. The regimental means of evacuation are employed for evacuating the combat vehicles direct from the battle-field, while the divisional and army means are used for the evacuation of these vehicles to the damaged combat vehicle collection points.

49. The evacuation of submerged combat vehicles consists of hauling them out by a prime mover, or raising them from the water with the help of special equipment. A report is sent to the Chief of the army tank technical service about any vehicles which cannot be evacuated with the forces and resources of units or tactical formations. The report is accompanied by a field sketch with an appropriate legend giving a short description of the terrain, the number of evacuation routes, the nature of the damage, the location of the equipment, and the probable extent and nature of preparatory work required before beginning the evacuation.

50. The preparatory work preceding the evacuation of a damaged combat vehicle includes an examination of its location and technical condition. Note is also taken of the number of the crew, the mark and number of the vehicle, the parent sub-unit of the vehicle, the nature of the damage, the extent of the work which has to be carried out in order to remove the vehicle, the approach routes to the damaged combat vehicle, and the necessary means for evacuation.

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[redacted]

51. When salvaging submerged vehicles, use is also made of divers (aqua-lung divers), who determine the position of the vehicle in the water, the nature of the bottom, the location of the damage, etc.

52. General work connected with the preparation of a damaged combat vehicle for evacuation includes:

- mine clearance, and clearance of the approach routes to the damaged vehicle;
- mine clearance and de-activation (decontamination) of the vehicle;
- carrying out of essential repair work on the transmission system;
- adjustments to the steering systems;
- preparation and mounting of auxiliary equipment;
- preparation and attachment of towing, hauling, or raising equipment;
- preparation of the evacuation route (setting up of indicators, straw markers, etc.).

53. The number of combat vehicles which can be evacuated by the available means in one day, is calculated according to the following formula:

$$N = \frac{Ivtn}{sk}$$

where - N = number of combat vehicles for evacuation;

I = number of prime movers used for the evacuation;

v = average towing speed (in kms. per hour: this is determined on the basis of the condition of the roads, the season, time of day, weather, and the technical condition of the prime movers);

t = the time of operation of the prime movers during the evacuation (the time depends on the nature of the combat tasks being carried out, and their continuity);

s = length of the evacuation route (in kms.);

n = the factor of utilisation of the time of operation of the prime movers during towing; this amounts to 0.6 - 0.7 (it depends above all on the time required for preparatory work);

k = the

[redacted]

k = the average number of prime movers required for the evacuation of one tank, or the traction factor (this is determined on the basis of the nature of the ground, the condition of the evacuation route, the season, weather and degree of damage to the vehicle; its average value is: in terrain with deep relief, 1.5 - 2, in terrain with weak relief, 1.).

54. A very important element of the technical supply system in support of combat operations by troops is the supplying of units with armoured equipment and with materials and installations essential for tank repair (servicing), or evacuation.

55. The supply of forces with armoured equipment takes place in accordance with the allocation lists drawn up by the army or Front command. It is the duty of the tank technical service to organise the acceptance of the new equipment, technical protection of the equipment during its transport to the units, and to prepare it for use.

56. The supply of units with replacement assemblies (sub-assemblies) and parts, necessary for carrying out repairs by the method of changing the complete assemblies, will depend on the technical condition of the equipment held by the units, the extent of its use, the efficiency of the repair facilities on their establishment, and the expected number and nature of combat losses. When specifying the requirements, particular account should be taken of the nature of the damage and the names of the assemblies needed for repairs.

57. When organising supplies for the forces, one should take into account:

- the necessity for ensuring a centralised system of supply to the forces of armoured equipment and essential repair material;
- the maximum utilisation for the repair of armoured equipment of local resources (metals, auxiliary materials);

.../- the possibility

- the possibility of making use of usable assemblies and parts dismantled from vehicles regarded as written off;
- the possibility of repairs of assemblies and instruments by repair works in the country.

58. Units and tactical formations have a mobile stock of replacement parts and other technical material intended for executing repairs under field conditions. This stock enable them to carry out repairs, using their workshops to the fullest extent, without the need for additional supplies from a higher level of command, during a period of 5 or 6 days. The stocks of replacement parts and other technical materials necessary for running and medium repairs are detailed in the repair kits /zestaw remontowy/ *.

59. Repair kits are issued during the danger period, the divisions being issued with kits for medium repairs, and regiments for running repairs. In the course of combat operations, as the spare parts become used up, the supply is done not by kits, but according to actual needs (on submission of requisitions). The carriage of armoured equipment to stores and magazines is carried out as a rule on the transport vehicles of the superior level of command. Cases may, however, arise where the necessary supplies are brought up on the transport of the unit being supplied.

60. During operations in industrial areas, the forces may use the local resources for obtaining such materials as steel, non-ferrous metals, electrodes, acids, and in certain cases also spare parts for motor vehicles.

61. In cases when the bringing up of supplies is difficult, the repair sub-units may (with the permission of a higher level of command) make use of usable assemblies and instruments from vehicles regarded as written off or

.../ designated for further evacuation

* A repair kit is a collection of spare parts, instruments, assemblies, and materials (of a specified purpose) needed for carrying out a given type of repair.

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designated for further evacuation. For this purpose, special groups are organised for dismantling the written off tanks. It should be remembered, however, that using the repair sub-units for dismantling damaged tanks draws them away from the execution of their principal task. For this reason, the above method of obtaining material necessary for repairs should only be resorted to in a critical rear situation.

62. In order to ensure the continuity of work of the repair and repair-evacuation groups, a part of the supplies loaded on motor trucks is included in the composition of these groups. A part of the stocks of armoured equipment, also loaded on motor trucks, is held in the area of deployment of repair facilities. The amount of these stocks depends on the situation and the capacity of the repair facilities, and should, in principle, be sufficient to ensure the execution of repairs for 2 or 3 days, without bringing up any repair materials from the stores. The remaining supplies are kept in the armoured equipment store, deployed in the area of the divisional supply point.

II. Organisation and Planning of Technical Support for the Operations of an Armoured (Mechanised) Division

63. Technical support for the operations of an armoured (mechanised) division is organised in order to ensure the possibility of the maintenance of full combat capacity of the division throughout the duration of the battle. Support of this kind is organised on the basis of the task of the division and the decision of the commander, directives concerning technical support for the superior HQ, the condition of the combat vehicles and repair facilities of the division, and the nature of the operations by the enemy.

64. The organisation of technical support combines in itself organisational measures and command, the implementation of which is necessary for the preparation and conduct of the battle. These measures include:

.../ - the planning of

- the planning of technical support;
- the clearance of technical service problems with the HQs of the division and of other services;
- the issue in good time of the tasks to the forces and resources of the technical supply system;
- the organisation of the direction of technical support forces and resources during the period of preparation and in the course of the battle;
- checking the execution of the orders concerning technical support, and the work of the repair and evacuation facilities.

65. The main work connected with the organisation of technical support begins with the moment of the reception of the combat task by the division. During this period, the commander's assistant for technical matters should study the combat task and carry out an appreciation of the situation from the point of view of technical support for the future operations. He should also carefully calculate the time necessary for the execution of all the measures connected with support of this type.

66. When preparing these measures, account should be taken of the order issued by the service command of the higher level of command. The order should state:

- the time for completing the evacuation and repair of equipment during the period of preparation;
- the extent of the technical servicing of equipment, and the method of its execution during the period of preparation and in the course of combat;
- methods of using the repair and evacuation facilities in the course of combat;
- the time and areas of organisation of damaged combat vehicle collection points, the sequence of deployment in them of repair and evacuation sub-units of a higher level, and the methods of transport to them of the damaged vehicles;
- ... the areas and time

- the areas and time of deployment of the armoured equipment store, and the methods and sequence of supply;
- forces and resources allocated for reinforcement of the division.

67. As has already been mentioned, the commander's assistant for technical matters carries out an analysis of the combat task from the point of view of technical support. During this analysis, he should determine to what extent the depth of the task and the width of the zone of operation, as well as the place of the division in the operational grouping, affects the placing and method of operation of repair and evacuation sub-units, and the echelonment of stocks and the method of supplying the forces with materials needed for repairs.

68. During the appreciation, the commander's assistant for technical matters determines:

- the quantity and technical condition of the equipment;
- the conditions for organisation of use of the equipment;
- the conditions for organisation of repairs and evacuation;
- the state of supply;
- the conditions for organisation of ground defence and defence against weapons of mass destruction of the repair forces and resources;
- the organisation of the control of the technical support forces and resources.

69. When assessing the quantity and technical condition of armoured equipment, account is taken of the degree to which the division is provided with equipment of various types (tanks, personnel carriers, etc.), the possibility of bringing the equipment up to strength before beginning operations and in the course of battle, and the mileage reserve according to the various marks (types) of combat vehicles (Appendix 4). In the recommendations, one should state the requirements of the units as regards supplying them with various categories of equipment,

the possibility of ensuring the execution of repair tasks, and measures aiming at maintaining the combat vehicles in a permanent state of technical efficiency.

70. When making an appreciation of the conditions of use of the equipment, attention is paid to the configuration of the ground, the season, weather, the state of the roads and their effect on the use of the equipment, the degree of technical training of crews, their practical experience, the mileage in hand before the next technical servicing, the number of facilities for technical servicing, and the expected mileage (depending on the depth and nature of the tasks). Following this assessment, one should decide on measures connected with the further training of crews, the extent of technical servicing and the means for carrying it out, and the deployment areas of repair and evacuation sub-units and the method of their employment.

71. When making an appreciation of the conditions for the organisation of repairs, one should take into consideration the quantity, condition, and location of the damaged vehicles before the beginning of the battle, the strength of the repair sub-units, the capacity of the repair facilities, the effect of the nature of combat operations of own and enemy forces on the organisation of repairs, and the areas of probable losses of armoured equipment. The conclusions drawn from such an appreciation are used for determining the measures aiming at completing the repairs to equipment before the beginning of the operations, the division of repair forces and resources according to tasks, the areas for setting up damaged combat vehicle collection points, the sequence and method of deployment and movement of repair sub-units, the method of de-activation and decontamination of the equipment to be repaired, and the methods of transporting the combat vehicles for repair.

72. As a result of the assessment of the conditions for the organisation of evacuation, one determines the quantity and location of the equipment requiring evacuation, the number and technical condition of the means of evacuation and their capacity, the routes of evacuation to the damaged combat vehicle collection

points, and the effect of the terrain, season, and time of day on the methods and possibilities of effecting the evacuation.

73. When making an appreciation of the state of supplies, one should take into consideration the quantity of material assembled in stores and in repair sub-units, the conditions of use and technical condition of the equipment, the general supply requirements, methods of replenishment, and possibilities of bringing up supplies.

74. The assessment of the conditions for the organisation of defence against weapons of mass destruction should form the basis of conclusions concerning the possibility of warning the repair forces and resources of the existence of the danger of air attack, concerning the condition and quantity of the means for conducting detection of radiation, de-activation, decontamination, the composition of repair and evacuation forces and resources detailed for removing the effects of enemy nuclear strikes, the method of their use, and conditions for the camouflage, defence, and protection of repair and evacuation equipment.

75. In order to be able to specify in detail the deployment areas of the repair sub-units, and the routes of evacuation, the commander's assistant for technical matters may personally participate in a reconnaissance carried out by the commander, or carry out a reconnaissance on his own, or detail officers to be included in the quartermaster reconnaissance group.

76. The main conclusions drawn from the study of a task, an appreciation of the situation, and reconnaissance, form a basis for the preparation by the assistant for technical matters of proposals concerning the technical support of future operations. These proposals should be submitted by him to the divisional commander. The form and content of the report will depend on the general situation, time, and the degree to which the commander is acquainted with the technical situation. In the majority of cases, the report will take the form of answers to questions from the commander. It should be remembered, however,

that the commander's assistant for technical matters should be prepared to give the commander a full report, dealing with the following subjects:

- the number and technical condition of combat and auxiliary vehicles, the mileage in hand and its probable future consumption, and the present state of fitting-out of units with armoured equipment;
- the possibility of providing equipment replacements for the division, the method of obtaining them, and the state of the equipment of the division at the beginning of operations;
- the extent of the equipment, and the degree of readiness of repair and evacuation sub-units;
- the state of the supplies and the possibilities of replenishment;
- other proposals concerning the organisation of technical support (up to the time of beginning of operations and during their conduct).

77. Having accepted the proposals of the assistant for technical matters, the divisional commander determines the time-limits and sequence of preparing the equipment and the repair and evacuation sub-units for the future operations, the time necessary for the preparation and setting up of damaged combat vehicle collection points, the deployment areas and methods of moving the repair and evacuation sub-units during the battle, the sequence of repair and evacuation of equipment, and technical servicing.

78. The accepted proposals, and the directives of the commander, form the basis for the preparation of a technical support plan. The plan may be drawn up in written or graphic form (with a legend), and should contain:

- the extent of the work, the time and the place of technical servicing during the period of preparation and in the course of combat, the resources allocated for it and the method of their utilisation;
- the extent of repair

- the extent of repair work carried out by own resources until the beginning of the battle, the method and sequence of transporting equipment to repair units of a higher level, the method of repair during combat, the grouping and echelonment of repair facilities and their tasks, the areas and times of setting up repair workshops and the methods of their regrouping, the areas for organising damaged combat vehicle collection points, the distribution of repair means, reinforcements, the methods of de-activation and decontamination of damaged equipment and of repair and evacuation facilities;
- the method of evacuation, the repair and evacuation axis, the distribution and tasks of the evacuation facilities, the areas of deployment and the methods of using the allocated evacuation resources, the method of evacuation of equipment during the process of liquidation of the effects of a nuclear strike;
- the method of supply of material, the place, time, and methods of replenishment, the necessary (minimum) stock of material required for repairs;
- the organisation of protection and defence of repair and evacuation facilities, measures to be taken for defence against weapons of mass destruction;
- organisation of observation of the battle-field, the sequence of sending reports on the quantity and technical condition of the equipment, instructions issued in connection with the evacuation and repair of damaged equipment, the state of supplies and the condition of repair and evacuation facilities.

79. Of the above points, embodied in the technical support plan, the following are cleared with the divisional HQ: the expected future mileage, the areas and time for carrying

time for carrying out technical servicing, the probable losses and areas containing the greatest number of equipment requiring repairs, the areas of deployment of the repair sub-units, the time-limits for submitting technical balance-sheets and reports, the organisation of communications, and the possibilities of allocating sub-units of engineer and chemical troops, and of de-activation (decontamination) facilities, for carrying out some of the work connected with technical support.

80. Arrangements are made with the quartermaster regarding the times and areas for bringing up POL and other expendable supplies, the time and place for setting up organic and allocated repair and evacuation facilities in the rear area, the evacuation routes, the areas for setting up the armoured equipment store, the organisation of protection and defence, and the repair and evacuation axis.

81. Arrangements are made with the Chief of the chemical service regarding de-activation of the ground and of the equipment in the area of deployment of the repair and evacuation facilities, and the methods of carrying out radiation detection.

82. Arrangements are made with the Chief of the engineer troops regarding, among others, the clearance of mines and field engineer work on the evacuation routes and in areas containing damaged equipment.

83. The technical support plan, after clearance with the HQ and the Chiefs of services, is confirmed by the divisional commander. The contents of the plan are communicated to the persons carrying it out in the form of orders signed by the Chief of Staff and the assistant for technical matters. Orders communicated for action to technical officers, or addressed to repair and evacuation sub-units, are signed by the assistant for technical matters. If there is no time to prepare a technical support plan, the executive orders may be based on the confirmed proposals of the assistant for technical matters and on the directives noted down by him, issued by the divisional commander.

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84. In the course of operations, the plan should be kept up to date in conformity with the existing combat situation, by means of additional orders sent to the executors. All orders amending the technical support plan should be reported to the commander and should be communicated to the HQ and the quartermaster.

85. When organising and planning the technical support, considerable attention should be paid to evacuation. When planning measures connected with it, one should take into consideration:

- the combat task being executed by the division;
- the number of prime movers, their technical condition and approximate capacity for evacuation;
- the vehicular capacity of the evacuation routes;
- the number of prime movers required for the evacuation of one vehicle;
- the loading of the prime movers and the duration of effective work;
- the degree of training of the prime mover driver-mechanics;
- weather conditions, season, time of day, and nature of the ground on which the damaged equipment may be situated.

86. On the basis of the above, it is possible to determine with great accuracy the number of vehicles which may be evacuated with existing means in one day. This, in turn, makes it possible to carry out a correct division of the means of evacuation held on the establishment and to assess the need for reinforcements.

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87. When the operations begin, the commander's assistant for technical matters should be with the divisional HQ, together with a part of the officers from the technical branch. He reports to the commander and informs the divisional HQ about the technical situation, and in return receives information

about the decisions and orders of the commander and on the situation of the armed forces. In order to be able to direct the repair and evacuation sub-units, the commander's assistant for technical matters should be provided with a special technical support communications system (Diagram No. 11). In a regiment, these communications should be maintained with the technical observation posts, the repair and evacuation groups, the regimental workshops, and with the divisional commander's assistant for technical matters. The radio data of the technical support communications network should be known to all the crews of combat vehicles. In the event of a tank being damaged, its crew, after reporting the fact to the sub-unit commander and obtaining his permission, switches into the radio network of the technical support organisation, in order to inform the repair and evacuation sub-units of the fact of the damage and of the location of the tank.

88. The divisional commander's assistant for technical matters should have radio communications with the regimental commanders' assistants for technical matters, his subordinate repair and evacuation sub-units, the divisional armoured equipment store, and his service superiors. In order to be able to exercise a more effective direction and control, the commander's assistant for technical matters, in addition to the technical support communications network, also uses the network of the divisional HQ and QM service.

89. In the course of battle, the officers from the technical branch of the division are responsible for the reporting and working maps, on which they draw in the current technical and combat situation. The maps should contain the following data: the location of organic and allocated repair and evacuation sub-units, areas of damaged combat vehicle collection points, the location of armoured equipment stores of the superior commander, the deployment areas of combat vehicles requiring repair, evacuation, or transfer, the supply and evacuation routes,

evacuation routes, the repair and evacuation axis, essential data concerning other services (e.g., the engineer service, etc.). One also draws in on the working map data about the enemy which are essential for the correct appreciation of the situation and for determining the probable areas of greatest combat losses. The location of own forces is indicated by a general outline, without giving their tasks or designations. In the case of reporting maps submitted to the superior commander, in addition to detailed data on the technical situation, one draws in the essential data about the position of own troops, giving their full designations.

The grouping of repair and evacuation sub-units

90. In order to utilise to the full the capacity of repair and evacuation sub-units, they should be grouped in such a way as to make it possible to carry out with them any manoeuvre resulting from a specific situation. In order to give technical first-aid to damaged combat vehicles, to carry out running repairs (on the spot where damaged), or for evacuation, one organises at regimental level technical observation posts and repair and repair-evacuation groups.

91. The main task of the technical observation posts during combat is to watch the combat vehicles, determine the location and reasons for their stoppage, and the nature of the damage, and to carry out preparatory measures for their evacuation or repair. The technical observation posts are organised with the resources of the fighting sub-units, on the basis of directives from the regimental commander's assistant for technical matters.

92. A company technical observation post includes the company commander's assistant for technical matters, a tank fitter, a chemist-dosimetrist, and sappers. A technical OP may exist independently, or it may form part of a repair and evacuation group supporting a given company. In a mechanised regiment, technical OPs are placed near the OPs of a battalion of motorised infantry.

93. Immediately a tank stops on the battle-field, one dispatches to it a tank fitter or other repair specialists, in order to determine the reason for the stoppage of the tank and the extent of repair and evacuation work. The commander of a technical OP maintains continuous communications with a repair, or repair-evacuation, group (if it is operating independently), and with the regimental commander's assistant for technical matters, to whom he reports the number, location, and technical condition of the damaged vehicles, and the work which has been carried out in preparing them for evacuation and repair.

94. A repair group includes 1 or 2 special motor vehicles, and a motor vehicle with spare parts, fuel and lubricants. A repair-evacuation group has, in addition, 1 or 2 armoured prime movers. In addition, in order to carry out a reconnaissance of mine-fields, a repair or repair-evacuation group may have attached to it a number of sappers.

95. In a tank regiment, it is possible to organise from existing forces and resources two or three repair or repair-evacuation groups for the direct support of first-echelon tank companies, and one or two regimental groups.

96. In a tank battalion of a mechanised regiment, one organises one repair or repair-evacuation group, while on a regimental level one organises one or two groups.

97. The repair (repair-evacuation) groups should be kept at such a distance from the fighting sub-units as to be out of range of observed enemy fire, and as to be able to reach the damaged tanks in time. The work of the repair and repair-evacuation groups is directed by the commander's assistant for technical matters.

98. The main principle of repairs in a regiment is to carry out the work on the spot where the combat vehicle was damaged. In the event of the incidence of a large number of defective combat vehicles in one area, one may organise a regimental damaged combat vehicle collection point. However, the name

"regimental collection point"

"regimental collection point" should here be regarded as only a conventional name, since the damaged vehicles will not be collected in some small area, but will remain at the places where they were damaged, or in nearby places of concealment. The actual collection point will be the place of deployment of the repair and evacuation facilities, and of transport carrying spare parts and POL.

99. The divisional mobile tank repair workshop is set up places containing the greatest number of damaged vehicles, where one organises the divisional damaged combat vehicle collection point. Repair brigades may be detached from the tank repair workshop, to reinforce the regimental repair sub-units.

100. The divisional damaged combat vehicle collection point should contain, in addition to repair and evacuation equipment, also stocks of POL, ammunition, and spare parts.

101. The damaged combat vehicle collection point is organised in the rear area with the forces and resources of a division. When selecting the area for setting up the collection point, one should take into consideration not only the combat situation, ground conditions, and the location of the damaged vehicles, but also the most economical way of using the available time and the evacuation equipment necessary for the collection of the damaged vehicles. The commander of the collection point is the commander of the workshop whose facilities have been deployed for the repair of combat equipment.

102. The area for setting up the damaged combat vehicle collection point is chosen in a locality possessing natural cover facilitating the construction of field engineering works, near supply and evacuation routes, and near sources of water supply; the ground conditions should make it possible to set up conveniently the repair facilities, and to organise the work in a proper manner.

103. In conditions of a constant threat from weapons of mass destruction, the collection point should be organised at a safe distance from the probable targets for enemy nuclear strikes. One should also avoid an excessive

.../ concentration

concentration of repair facilities, damaged equipment, repaired combat vehicles, and supplies. An area chosen for the collection point should be reconnoitred in advance from the point of view of contamination with radio-active substances (before the arrival of the repair forces and resources).

104. In order to disperse the equipment in the collection point, in the event of the concentration in one area of a large number of damaged vehicles, it is recommended (and, if there is sufficient time, even essential) to organise the following:

- a dosimetric post, for the purpose of determining the degree of irradiation of combat equipment sent for repair;
- places for de-activation and decontamination of the contaminated equipment;
- reception points for the equipment, where the vehicles are washed (if they have not been contaminated) and given a general examination;
- repair points;
- deployment area of the special work platoon;
- collection points for unusable equipment set aside for further evacuation, which is undergoing preparatory work for evacuation;
- collection point for repaired equipment;
- places for billeting repair sub-units and tank crews.

105. The repair facilities may move to the next damaged combat vehicle collection point either simultaneously, or in individual groups. The repair and evacuation sub-units which have not finished the repairs in the existing area leave behind with the equipment only the necessary minimum of forces, under the command of an officer who is responsible for completing the repairs. The main part of the force, on the other hand, regroups in the new collection point area.

Workshop managers collect the combat equipment as the repairs are completed and, under the directions of a designated officer, send the equipment to the units. If the distance of the damaged combat vehicle collection point from the units is considerable, the movement of the repaired equipment is protected by a special motor vehicle of the armoured car type (A/Panc.). Before the equipment is returned to the units, all the combat vehicles undergo full technical servicing No. 2 or No. 3.

106. Combat vehicles are sent for repair by the technical officers of sub-units and units and, within units, also by tank and sub-unit commanders. Tanks are sent for running repairs carried out in the period of preparation for operations on the basis of instructions from the (regimental) divisional commander's assistant for technical matters, no documents being prepared. For medium repairs, carried out with divisional resources, the tanks are sent with permits issued by the technical branch of the division. A statement is prepared for each tank, describing its technical condition, which is then confirmed by the regimental commander (in the course of combat, this statement is usually prepared while the repairs are being carried out).

107. When damaged tanks are handed over to the army, one prepares a statement about their technical condition, and a handing-over and receipt document /protokol zdawczo-odbiorczy/.

108. For running and medium repairs, combat vehicles are sent together with their crews, which take part in the repair work (when the repairs are in progress, it is forbidden to use the crews for any other duties).

109. For capital repairs, combat vehicles (without crews) are sent on the basis of an order issued by the Front tank-technical service command. The vehicle is accompanied by a statement on its technical condition, a handing-over and receipt document, and all the other documents belonging to the vehicle. After handing over, the combat vehicles are written off from the unit strength.

110. On completion of running repairs in the regimental or divisional workshops, the combat vehicles are accepted by the technical officers of the sub-units, without any written records. Combat vehicles returning from medium repairs executed in the divisional workshops are taken over by representatives of the regiment, on the basis of official certificates. Tanks which had undergone medium repairs on an operational formation level are accepted (on the basis of written certificates) by representatives of the regiments, in the place where the repairs were carried out.

III. Implementation of Technical Support Measures for an Armoured (Mechanised) Division in the Course of Offensive Operations.

111. An armoured division may attack a previously-prepared enemy defence in the first or second echelon, from direct contact with the enemy, or from areas situated in the depth of the operational grouping. A division allocated for the first echelon of an army, which has hitherto been in the second echelon of the defence, will be situated during the period of preparation in the concentration area. In such a case, it will have suitable conditions and a sufficient amount of time to organise the attack. During this time, one can carry on the technical training of crews, repair and evacuation sub-units, and technical officers. In addition, the period of preparation should be utilised for the completion of all repair and evacuation work, so as to ensure the full exploitation of the technical support facilities during the attack.

112. When preparing the equipment, one should take into account the fact that the combat operations of a division may last about 5 days. For this reason, depending on the mileage consumed since the last technical servicing, one should carry out technical servicing No. 2 or 3 on all the combat vehicles. To assist the units, one may also direct to them the forces and resources of the mobile tank repair workshops, equipped with suitable expendable stores.

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113. In order to ensure technical efficiency of equipment to the full depth of the operation, the combat vehicles should have a suitable mileage reserve since the last medium and capital repair. For instance, if the depth of an army offensive operation is 250 - 300 kms., and the manoeuvre factor is 2 - 2.5, then the tanks should have a mileage reserve of 500 - 750 kms. The mileage reserve may be increased by exchanging all those assemblies and devices which, on account of their technical condition, cannot guarantee the efficient functioning of all the mechanisms in the required time. Measures connected with increasing the mileage reserve in the division are carried out as part of the work organised and planned by the army (Front), and should be supported by adequate supplies of material. The divisional commander's assistant for technical matters, using as a basis the technical condition of the equipment, and following the instructions of the Chief of the tank-technical service of the army, defines the extent of these measures, indicates the method of their implementation, and allocates suitable repair facilities.

114. For work connected with increasing the mileage reserve, use may be made of army repair facilities. In addition, the army may exchange for a division the combat vehicles having the lowest mileage reserve for vehicles which have arrived from factories or from capital repair. In such a case, the divisional commander's assistant for technical matters organises the reception of the equipment, divides it up (after prior consultation with the divisional HQ), and allocates it to the regiments.

115. One should remember, however, that it will not be possible to increase the mileage reserve in all combat vehicles. For this reason, the necessity will arise in the course of operations for carrying out repairs to those combat vehicles whose mileage reserve has become exhausted.

116. During the period of preparation for attack, the stock of damaged vehicles in a division may consist of losses suffered in previous combat operations,

or from enemy

[redacted]

or from enemy nuclear strikes. The damaged equipment may be grouped at regimental, divisional, and army damaged combat vehicle collection points; it may also remain in places where it received the damage. In order to obtain the maximum number of tanks fit for battle, the divisional commander's assistant for technical matters should organise, up to the time of beginning the attack, the running repair of damaged combat vehicles. When organising running repairs, one should follow the principle that this category of repairs is carried out by regimental forces and resources. The divisional forces and resources, on the other hand, are only used for this purpose when the regiments are unable to carry out all the work by themselves.

117. The divisional repair resources are primarily used for the repair of combat vehicles grouped at the regimental and divisional damaged combat vehicle collection points. Single tanks, which it is not possible or worth-while to evacuate to the collection points, are repaired by detached repair brigades.

118. During the period of preparation, one should also assemble in regimental and divisional stores suitable stocks of spares and equipment necessary for the repair of armoured equipment in the course of operations.

119. After the beginning of the operations, the division going over to the attack from a starting area located in the depth, moves up a part of the forces and resources of the mobile tank repair workshops in the wake of the regiments of the first echelon, in readiness to bring them technical aid. These forces and resources should form a small and swift group, so as to be able to maintain the speed of march of the units. For instance, a group of this sort may be composed of: 1 - 3 assembly and dismantling devices, a part of the necessary special motor vehicles, 3 - 4 armoured prime movers, and one motor vehicle with spares. The remaining forces and resources of the mobile tank repair workshops follow behind the regiments of the second echelon. Until the division reaches

.../ its starting line,

its starting line, they form the technical support column of the main forces. The repair resources allocated for technical support should repair all the combat vehicles assigned to them, and should proceed to the new deployment area in the second half of the day of battle.

120. As soon as the attack is begun, the resources allocated from the mobile tank repair workshops, which have been following the first echelon of the division, proceed to the appointed area so as to set up the first damaged combat vehicle collection point of the division. The area of the divisional collection point should be situated in a locality providing suitable conditions for camouflage, and if possible on the axis of the main thrust. The area is usually chosen at a distance of about 3 kms. from the enemy FEBA (in its original situation).

121. In areas of deployment of damaged combat vehicle collection points in front of the enemy FEBA, one should utilise all the places of concealment and shelters previously prepared by one's own troops. The field works left by the enemy may be used only after they have been subjected to radiation and field engineer reconnaissance.

122. If in the area selected for the organisation of a damaged combat vehicle collection point there is only a small number of damaged vehicles, then the collection point should be organised in the depth of the enemy defence (that is, in a place where there will be the greatest incidence of tanks requiring repair). In this case, the most convenient area will be the enemy regimental or divisional reserve position.

123. The forces and resources of the mobile tank repair workshops situated behind the regiments of the second echelon of the division move along the repair and evacuation axis, from one place of concealment to another. If necessary, they leave the special repair equipment and a part of the stocks of material at the first damaged combat vehicle collection point. The deployment of ~~these forces~~ ... and resources

and resources of the mobile tank repair workshops takes place at the second collection point, which is organised after the completion by the division of its second task (in the area of the former enemy second line of defence). In this way, the divisional mobile tank repair workshops can set up two damaged combat vehicle collection points during the period of the breaking down of the tactical depth of the enemy defence.

124. When examining the problems of technical support of an armoured (mechanised) division in the course of offensive operations, one should point out that its repair and evacuation forces and resources can give technical assistance primarily to combat vehicles damaged by the fire of conventional enemy weapons. This depends both on the time available to repair and evacuation sub-units for the execution of their work, and on the production capacity of the repair workshops.

125. A division may suffer casualties from nuclear weapons when approaching the starting line for the battle. In this situation, the units of the division will be at a distance facilitating nuclear strikes by the enemy without endangering his leading sub-units. In the course of the attack, i.e., after establishing contact with the enemy, nuclear strikes may be carried out against second echelons of the division and on its reserves situated at a certain distance from the line of contact of the two combatants. The strikes will most frequently be made with the help of aerial nuclear bombs of a low yield.

126. In the event of the enemy carrying out a nuclear strike against one of the regiments, the division should give technical assistance to the regiment to an extent necessary to enable the regiment to continue its combat operations. Only the repair forces and resources of the neutralised sub-units should remain in the stricken area.

127. The repair and evacuation work as a whole, performed in this area, is taken over by the army repair and evacuation sub-units.

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128. The case may also arise when in the zone of operation of a division there may appear simultaneously a number of areas neutralised by enemy nuclear strikes, while the losses suffered by the division will be so large that it will be eliminated from the battle. In this situation, the divisional repair and evacuation sub-units will organise technical aid to the neutralised units. As a rule, the army should also allocate a part of its forces and resources for the liquidation of the effects of enemy nuclear strikes.

129. In order to ensure the repair of damaged combat vehicles during the second day of combat by the division, it is essential to include a part of the forces and resources of the mobile tank repair workshops direct in the combat grouping of the division. For this purpose, the manager of the mobile tank repair workshops, following the orders of the divisional commander's assistant for technical matters, allocates in advance a part of the forces and resources set aside exclusively for carrying out repair tasks on the second day of combat operations by the division. These forces and resources should be allocated from both parts of the mobile tank repair workshops deployed in the divisional damaged combat vehicle collection point.

130. During the breaking down of the tactical depth of the enemy defence, the divisional forces and resources allocated for carrying out running repairs at the place of damage of the combat vehicles (which are also located on the repair and evacuation axis), execute only the work which units are unable to undertake with their own resources. Taking into account the speed of attack by the division, these forces and resources can operate for 10 - 12 hours on one spot, without fear of losing touch completely with the attacking forces.

131. The forces and resources of a mobile tank repair workshop, deployed during combat at the divisional damaged combat vehicle collection point in the tactical depth of the enemy defence, can carry out repair work requiring more than 24 hours to execute. In view of the fact that these forces and resources

.../ are most

are most frequently detailed to support the operations of the division on the third day of battle, they can carry out both running and medium repairs.

132. In the event when the enemy defence has been powerfully neutralised by nuclear weapons up to the battalion defence positions inclusive, the regimental and divisional repair sub-units are not deployed, but are moved forward in readiness to carry out the repair and evacuation of damaged combat vehicles in the operational depth of the enemy defence. Damaged combat vehicles in the tactical defence zone are repaired with the forces and resources of the divisional technical support column, while vehicles which cannot be repaired by these means are handed over to the army.

133. If the division is going over to the attack from direct contact with the enemy, a part of the forces and resources of the mobile tank repair workshops is deployed in the starting position behind the regiments of the first echelon, at a distance of 6 - 8 kms. from the FEBA. The tasks, deployment areas, and sequence of movement of the workshop forces and resources will in this case be the same as in the previous operations.

134. The evacuation of damaged combat vehicles to areas of deployment of the repair forces and resources, or onto the repair and evacuation axis, is carried out with the help of prime movers belonging to the mobile tank repair workshops. Until the moment when the division completes its first task, the greater part of the means of evacuation is used for bringing the damaged vehicles to the repair forces and resources located in the first area of deployment of the damaged combat vehicle collection points (in front of the FEBA, or on the first line of the enemy defence). A part of the armoured prime movers which, during the approach of the division from an area situated in the depth, formed part of the technical support column, are moved up with the remaining forces and resources of the mobile tank repair workshops. If there is a shortage of prime movers, the prime movers from the technical support column may also be used for the evacuation

evacuation of combat vehicles to the first area of deployment of the divisional damaged combat vehicle collection points.

135. On completion by the division of the whole-day task, one should bring up forward the divisional prime movers, which will be used for the evacuation of tanks from the first zone of defence, and some from the second zone. These prime movers, together with a part of the divisional repair resources, will be used for the technical support of the division during the second day of combat.

136. On completion by the division of the whole-day task, one should also carry out technical servicing in the regiments. This usually embraces the scope of work of technical servicing No. 1. In regiments of the second echelon, technical servicing may be carried out even before the completion by the division of the whole-day task. In all cases, the duration of the technical servicing, and the areas where it is to take place, will be specified by the divisional commander.

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137. During action in the operational depth of the enemy defence, the attacking forces will as a rule be breaking down a defence hastily organised by the enemy units withdrawing from the direction of the FEBA, or advancing from the rear. In this situation, technical support is organised during the approach to the enemy defence line. Until the moment when the forces approach this line, the divisional commander's assistant for technical matters will have at his disposal a very small amount of time for organising the execution of all the technical support measures. The damaged vehicles will at this time be dispersed over a wide area, while a considerable part of the forces and resources of the mobile tank repair workshops may be occupied in repairs of equipment damaged during the previous operations. These forces and resources may be situated at a considerable distance from the division and will therefore be unable to join the attacking forces in time.

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138. During the approach of the division to the enemy defence lines, the main forces and resources of the mobile tank repair workshops will be deployed in the divisional damaged combat vehicle collection point, where repairs will be carried out to vehicles damaged during the previous operations. The forces may only be accompanied by that portion of the repair and evacuation forces and resources which had formed part of the technical support column. If the forces and resources of the technical support column are earmarked, together with a part of the mobile tank repair workshops, for supporting the breaking down of the enemy defence, then they should carry out only such repair work which can be completed before beginning the attack. Otherwise, the forces and resources of the divisional technical support column should complete the repair of combat vehicles on the routes of advance of the forces, and should rejoin the division by the time it completes its first task. Equipment which has not been repaired with the resources of the divisional technical support column is grouped and passed to the army repair units.

139. During the approach to the enemy defence line, the majority of the divisional armoured prime movers is used in the technical support column. These prime movers assemble the damaged combat vehicles in specified areas, for the purpose of carrying out repair work, or for handing them over to the army.

140. As soon as the attack is begun, the resources of the mobile tank repair workshops, advancing behind the regiments of the first echelon, proceed to their appointed areas in readiness to undertake repair work. The deployment of the mobile workshops in these areas will depend on the number and nature of the damaged vehicles. If in front of the FEBA and on the first line of the enemy defence there is only a small number of damaged combat vehicles requiring the assistance of the divisional resources, then one should not organise a divisional damaged combat vehicle collection point near the starting line. In order to carry out essential work at places where the vehicles were damaged, one should detach from the mobile workshops repair brigades provided with suitable equipment and spares.

141. In the event when an attack from the march has failed, and the division is organising an attack after a short period of preparation, the divisional commander's assistant for technical matters should use the time allocated for the organisation of the attack for carrying out essential measures connected with technical support. As a first priority, one should organise the evacuation of equipment damaged during the attack from the march, particular attention being paid to the evacuation of those tanks which are situated in areas under enemy observation. For evacuating these tanks, the regiments are allocated prime movers from the divisional mobile tank repair workshops.

142. The time allocated for a fresh organisation of attack should also be used for moving forward the repair and evacuation forces and resources, for detailing the tasks of the repair sub-units, and for reconnaissance of the areas of their deployment. During this period, the necessity may arise for altering the subordination of the repair and evacuation forces and resources. For instance, the special motor vehicles and prime movers previously allocated to the workshops of a regiment operating as an independent unit, may return to the mobile tank repair workshops.

143. The extent of the work of the repair forces and resources in the area of deployment of the damaged combat vehicle collection point is determined in such a way as to enable them to arrive, together with the repaired equipment, in areas occupied by the division before beginning the battle on the following day. If all the repair work is not completed before the time of moving the repair forces and resources to the new area, then specially-detailed brigades are left behind to complete the work. The responsibility for the completion of this work is placed on an officer detailed from the mobile tank repair workshops, who should know the route and time-limit for arrival in the new area of the damaged combat vehicle collection point.

144. In order to speed up the evacuation of combat vehicles, the prime movers belonging to the mobile tank repair workshops may be sent to the repair and evacuation groups of regiments of the first echelon, or to the regimental repair and evacuation axes. The areas and times of arrival of the prime movers are communicated to the regimental commander's assistants for technical matters.

145. After breaking down a hastily-organised enemy defence, the divisional commander's assistant for technical matters brings up to date the technical situation and specifies which means should be left behind to complete the evacuation and repair work, and which should be moved up in the wake of the forces so as to support the further operations by the division. If the division is going over to pursuit, then one should organise a technical support column behind the main forces of the division, composed of a part of the forces and resources of the mobile tank repair workshops. As a rule, only a small amount of forces and resources may be allocated to the technical support column, since the mobile tank repair workshops will be engaged in the evacuation and repair of armoured equipment damaged during the breaking down of the enemy defence.

* * * * * *

146. Separate discussion is required of the organisation of support for the operations of a division in <u>offensive operations during the initial period of a war</u>. Operations during this period are characterised by violent changes in the combat situation, the absence of a continuous front line, high speed of attack, reaching 100 kms. in 24 hours, operation of forces on separate axes, the entry of these forces into action from the march and the adoption by them of a full combat grouping only in the event of encountering a powerful enemy resistance, the employment of a wide manoeuvre, and the aim of each of the opposing forces to carry out flank thrusts against the enemy forces moving in a march grouping. All encounters by both sides will usually take the form of encounter battles.

147. All this has a considerable influence on the means and methods of organisation of repair and evacuation of damaged combat vehicles. The most important principles which should be observed when organising technical support for combat operations of a division include:

- the possibility of bringing immediate technical aid to units which have suffered the biggest losses of combat vehicles from the effect of enemy fire;
- the necessity for moving the divisional repair and evacuation forces and resources under a screen by the attacking forces;
- the necessity for carrying out repairs of damaged combat vehicles on the repair and evacuation axis, which is usually chosen on the axis of operation of the main forces of the division; the combat vehicles will be evacuated to this axis by unit resources;
- the execution of running repairs requiring the least time;
- the maintenance of combat vehicles in a state of full technical efficiency, so as to ensure that the units are in a constant operational readiness for battle;
- the suitable echelonment of the divisional repair and evacuation forces and resources, in order to support every engagement which may be begun by subordinate units;
- the organisation and preparation of a manoeuvre with the repair and evacuation sub-units and the stocks of the division, in accordance with the current situation and the position of the forces;
- the preparation of the divisional repair and evacuation forces and resources for crossing zones contaminated with radio-active substances, and for carrying out measures for the partial de-activation of the damaged combat vehicles.

148. In order to ensure the maintenance of a rapid rate of attack by the forces, reaching 100 kms. in 24 hours, repair brigades are organised from the strength of the divisional repair and evacuation sub-units, for the purpose of carrying out running repairs. These brigades, equipped with means of transport and the necessary number of spare parts, advance under the shelter of the fighting forces along the divisional axis of repair and evacuation. The damaged combat vehicles will be evacuated onto this axis with the resources of the units or of the division. The repair brigades carry out running repairs requiring only a few hours' work, which will enable them to maintain a continuous advance in the wake of the attacking units. The effective work of one repair brigade, at a speed of march of the brigade of 20 kms. p.h. and a distance of 100 kms, lasts about 19 hours in each 24-hour period. With this approximate calculation, one should bear in mind that a repair brigade must not drop behind the leading units of a division by more than 15-20 kms. In consequence, over a distance of 100 kms., a brigade can carry out its work in three or four areas. In other words, repairs in each area should last no longer than 4.5 to 6 hours.

149. Damaged combat vehicles which will not be repaired with the resources of the division are handed over to the repair and evacuation units of the army.

150. The ways and methods, described above, of operation of the divisional repair and evacuation sources and resources, have as their primary purpose the securing of the quickest possible return to the fighting units of combat vehicles damaged by conventional enemy weapons. In the event of damage from nuclear weapons, all the repair and evacuation work is carried out, as has already been stated, by the forces and resources of the army. From these areas, the division may only evacuate those combat vehicles which are fit for service after undergoing running repairs.

.../ Appendices

Appendices

No. 1: Damage radius from nuclear weapons to armoured equipment and the crews of combat vehicles.

No. 2: Repair and evacuation capability (table for guidance).

No. 3: Echelonment of repair kits.

No. 4: Norms of consumption of POL, and the range of combat vehicles.

Diagrams

No. 10: Graph of damage to combat vehicles during the explosion of a nuclear bomb of a yield of 8 kt.

No. 11: Organisation of the radio network of technical support system of an armoured division.

Appendix 1.

Damage radius from Nuclear Weapons to Armoured Equipment and the Crews of Combat Vehicles

The radii given below determine the areas in which there is moderate damage to equipment and the loss of combat capacity of tank crews.

Yield in kt. /kilotons/	Tanks		Armoured carriers		Motor vehicles		Crews in tanks	
	g.b.	a.b.	g.b.	a.b.	g.b.	a.b.	g.b.	a.b.
2	0.25	0.25	0.30	0.4	0.55	0.65	0.5	0.5
5	0.35	0.35	0.45	0.55	0.7	0.85	0.65	0.65
8	0.4	0.4	0.5	0.65	0.85	1	0.7	0.7
10	0.45	0.44	0.55	0.7	0.9	1.1	0.75	0.75
15	0.5	0.5	0.6	0.8	1.05	1.2	0.8	0.8
20	0.55	0.55	0.7	0.85	1.15	1.4	0.9	0.9
30	0.6	0.6	0.8	1	1.35	1.6	1	1
50	0.75	0.75	0.9	1.2	1.55	1.9	1.25	1.25
75	0.85	0.85	1.05	1.35	1.8	2.1	1.35	1.35
100	0.95	0.95	1.15	1.5	2.	2.4	1.45	1.45
150	1.05	1.05	1.3	1.7	2.3	2.7	1.6	1.6
200	1.15	1.15	1.5	2	2.5	3	1.8	1.8
300	1.35	1.35	1.7	2.2	2.8	3.4	2	2
400	1.5	1.5	1.9	2.5	3	4.2	2.2	2.2

Notes:

1. The damage radius for tanks behind earthworks is 1.5 times smaller.
2. g.b. = ground burst; a.b. = air burst
3. The radii are given in kilometres.

Appendix 2.

Repair and Evacuation Capability
(Table for guidance)

Name of tactical formation (unit)	Repair capability per 24 hours: No. of workshops	Running repairs	Medium repairs	Extent of area (in sq.kms.)	Evacuation capability per 24 hours: No. of prime movers	No. of journeys at radius (?) of evacuation in kms. 5 - 7	12 - 15	12 - 20
Armoured Division								
Tank regiment	3	18	-	1	18	108	-	-
Mechanised regiment	1	3	-	0.7	3	18	-	-
Mobile tank repair workshops	1	9	or 3	2	5	30	-	-
TOTAL in Armd. Div.	-	21 - 30	0 - 3	-	26	156	-	-
Mechanised Division								
Tank regiment	1	6	-	1	6	36	-	-
Mechanised regiment	3	9	-	0.7	9	54	-	-
Mobile tank repair workshop	1	9	or 3	2	5	30	-	-
TOTAL in Mech. Div.	-	15 - 24	0 - 3	-	20	120	-	-
Operational formations								
*Independent tank repair brigade	1	-	8	3	4	-	12	-
**Independent tank evacuation brigade	1	-	-	1	30	-	-	60

/Field Comment: *This item was abbreviated to 'sbrcz', which was taken to stand for 'samodzielna brygada remontu czolgow'

**Abbreviated to 'sbecz', taken to stand for 'samodzielna brygada ewakuacji czolgow'/

Appendix 3.

Echelonment of Repair Kits

Name of tactical formation (unit)	Running Repairs Kit		Medium Repairs Kit	
	Quantity	Weight (in tons)	Quantity	Weight (in tons)
Armoured Division				
Tank regiment	2 x 3 = 6	27 - 45	-	-
Mechanised regiment	1	4.5 - 7.5	-	-
Armoured equipment store	3	13.5 - 22.5	2	50 - 70
TOTAL in Armd. Div.	10	45 - 75	2	50 - 70
Mechanised Division				
Tank regiment	2	9 - 15	-	-
Mechanised regiment	3 x 1 = 3	13.5 - 22.6	-	-
Armoured equipment store	2	9 - 15	2	50 - 70
TOTAL in Mech. Div.	7	31.5 - 52.6	2	50 - 70

Appendix 4.

Norms of consumption of POL, and the range of combat vehi)es

Appendix 4.

Mark of vehicle	Fuel		Oil		Range of combat vehicle (in kms)		Fuel consumption in litres per 100 kms.		Oil consumption in litres per 100 kms.	
	capacity of engine system	capacity of external (spare) tanks	capacity of lubrication system	capacity of external (spare) tanks	On metalled roads	On unmetalled roads	On metalled roads	On unmetalled roads	On metalled roads	On unmetalled roads
T-54A	532	280/735	82	35	420/660-440/700	270/425-290/450	180-190	280-300	6-8	7-11
T-34-85	545	270/670	85	90	300/750	250/530	160-170	230-250	6-8	7-10
PT-76	250	-	45	-	240/260	180-210 (60-70 on water)	90-100	230-280 (110-130 on water)	6	7
ZSU-57-2	640	285	82	35	400/420	300-320	220-230	280-300	6-8	7-11
IS-2	520	300	65	90	230-250	220-235	330-360	230-360	9-12	11-16
ISU-122	565	300	65	90	230-250	235-245	330-360	330-360	9-12	11-16
SU-100	400	290	85	90	300	250	160-170	230-250	6-8	7-10
BTR-40	120	-	7	-	285	240	42	50	-	-
BTR-152	300	-	11	-	up to 600	up to 600	50	50	-	-

Note: 1. When planning the consumption of POL, a filling unit for a tank [combat vehicle] is taken to be on an average 300 litres, which equals 690 kgs.

2. The range of a combat vehicle at this filling unit is taken to average up to 300 kms,

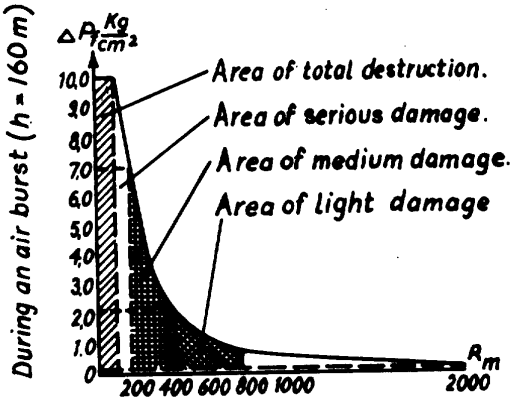
3. When calculating the quantity of engine oil for tanks, it is taken to be 16% of the amount of fuel consumed. In the case of motor vehicles, it is 4%.

4. The consumption of solid lubricants is 4% of the fuel consumed.

5. The figures in the denominator [i.e. on right of oblique stroke?] refer to modernised vehicles.

.../ Diagrams 10 and 11.

GRAPH OF DAMAGE TO COM
OF A NUCLEAR BO



Possible division of damage to combat vehicles into various types of repairs:

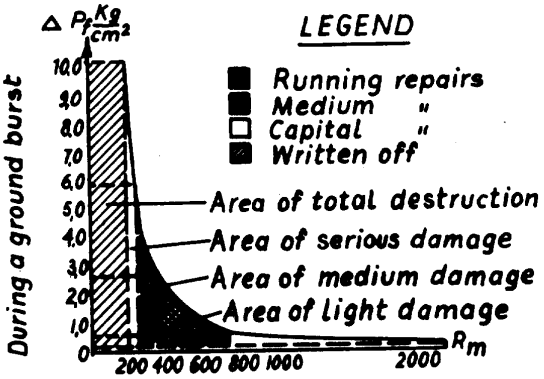
- *Running repairs* 45–47%
- *Medium* " 13–20%
- *Capital* " 13–20%
- *Written off* 14–26%

[redacted]

BAT VEHICLES DURING THE EXPLOSION

MB OF A YIELD OF 8 KT.

Diagram No 10



Nature of damage to combat vehicles:

- *When totally destroyed: cracking of armour-plating of hull, rendering assembly impossible. Broken transmission system. Damaged armament. Turret torn off.*
- *When seriously damaged: DSzK (?) machine-gun and entrance hatches torn off. Armour-plating buckled, turret torn off or jammed, gun shield torn off.*
- *When moderately damaged: DSzK machine-gun and entrance hatches torn off, mountings of internal equipment damaged, external equipment torn off, aiming and observation equipment damaged.*
- *When lightly damaged: DSzK machine-gun torn off, entrance hatches torn off or buckled, signal (?) and external cases and containers torn off. (one line of text probably missing.)*

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ORGANISATION OF THE RADIO NETWOF
SUPPORT OF AN ARMOURED DIVIS

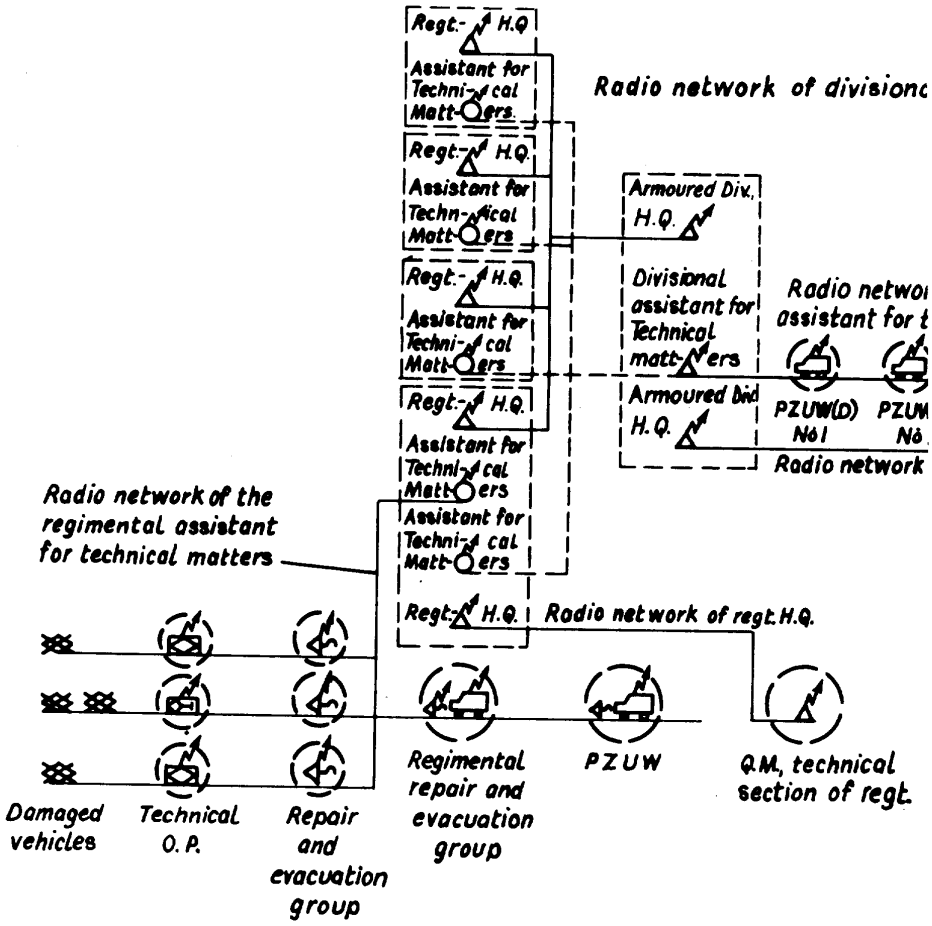

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Diagram Nò 11

K OF TECHNICAL

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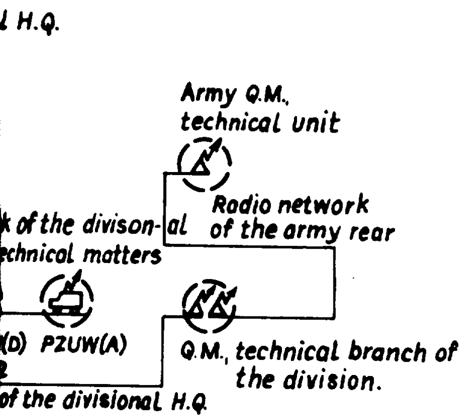

PZUW = *Probably "Damaged vehicle assembly point."*
(D) = *Divisional.*
(A) = *Army*